

# Notice of Allowability

Application No.

10/608,135

Examiner

Hanh B. Thai

Applicant(s)

GHEMAWAR ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed 9/15/06, the RCE filed 10/ 20/06 and the Telephone interview 12/21/06.
2. ☒ The allowed claim(s) is/are 1-9 and 12-17 and renumbered as 1-15.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some\* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material

5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

  
**ALFORD KINDRED**  
**PRIMARY EXAMINER**

### **DETAILED ACTION**

1. This is in response to the amendment filed September 15, 2006, the RCE filed October 20, 2006 and the Telephone interviews on December 21, 2006 and January 4, 2007.

#### ***Response to Arguments***

2. Applicant's arguments with respect to claims 1-9, 12-17 have been fully considered and are persuasive. The rejection of the claims has been withdrawn.

### **EXAMINER'S AMENDMENT**

3. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Paul Harrity on January 4, 2007.

The application has been amended as follows:

Claim 1. (currently amended) A method for performing operations within a file system in which directories and files are organized as nodes in a namespace tree, the method comprising:

associating a read-write lock with each of the nodes in the namespace tree;

acquiring a first lock on a name of one or more directories involved in a first operation;

acquiring a second lock on an entire pathname involved in the first operation;

determining whether the first lock or the second lock conflicts with third locks acquired by a second operation;

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performing the first operation when the first lock or the second lock does not conflict with the third locks, where the first, second, and third locks are read-write locks; and

serializing performance of the first and second operations when the first lock or the second lock conflicts with the third locks, where serializing performance includes:

determining an order for the first, second, and third locks based on levels of the namespace tree involved in the first, second, and third locks and within one of the levels of the namespace tree involved in the first, second, and third locks.

Claim 2. (original) The method of claim 1, wherein the performing the first operation includes:

concurrently performing the first operation and the second operation when neither the first lock nor the second lock conflicts with the third locks.

Claim 3. (original) The method of claim 1, wherein the first lock is a read lock.

Claim 4. (previously presented) The method of claim 1, wherein the second lock is one of a read lock or a write lock.

Claim 5. (original) The method of claim 1, wherein the first operation is a read operation, the first lock is a read lock, and the second lock is a read lock.

Claim 6. (original) The method of claim 1, wherein the first operation is a

namespace modification operation, the first lock is a read lock, and the second lock is a write lock.

Claim 7. (original) The method of claim 1, wherein the first operation is a snapshot operation, the first lock is a read lock, and the second lock is a write lock.

Claim 8. (original) The method of claim 1, wherein the determining whether the first lock or the second lock conflicts with third locks includes:

using a lazily allocated data structure that maps pathnames to locks to determine whether the first lock or the second lock conflicts with the third locks.

Claim 9. (currently amended) The method of claim 1, wherein serializing performance of the first and second operations further includes:

serializing the first, second, and third locks when the first lock or the second lock conflicts with the third locks.

Claim 10. (canceled)

Claim 11. (canceled)

Claim 12. (original) The method of claim 1, further comprising:

permitting the first and second operations to concurrently operate within a same one of

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the directories when neither the first lock nor the second lock conflicts with the third locks.

Claim 13. (currently amended) A system for performing operations within a file system, comprising:

means for obtaining one or more first locks on one or more directory names involved in an operation;

means for obtaining a second lock on an entire pathname involved in the operation;

means for detecting whether the one or more first locks or the second lock conflict with one or more third locks acquired by another operation;

means for executing the operation when the one or more first locks or the second lock do not conflict with the one or more third locks, the one or more first locks, the second lock, and the one or more third locks being read-write locks; and

means for serializing execution of the operation and the other operation when at least one of the one or more first locks or the second lock conflicts with the one or more third locks, where the means for serializing execution includes:

means for determining an order for the one or more first locks, the second lock, and the one or more third locks based on levels of a namespace tree involved in the one or more first locks, the second lock, and the one or more third locks and within one of the levels of the namespace tree involved in the one or more first locks, the second lock, and the one or more third locks.

Claim 14. (currently amended) A file system, comprising:

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a memory configured to store information regarding directories and files organized as nodes in a namespace tree; and

a processor connected to the memory and configured to:

associate a read-write lock with each of the nodes in the namespace tree,

acquire one or more first locks on names of one or more of the directories

involved in a first operation,

acquire a second lock on an entire pathname involved in the first operation,

determine whether the one or more first locks or the second lock conflict with one or more third locks acquired by a second operation,

permit the first operation to execute when the one or more first locks or the second lock do not conflict with the one or more third locks, the one or more first locks, the second lock, and the one or more third locks being read-write locks, and

serialize execution of the first and second operations when at least one of the one or more first locks or the second lock conflicts with the one or more third locks, when serializing execution of the first and second operations, the processor is configured to:

determine an order for the one or more first locks, the second lock, and the one or more third locks based on levels of the namespace tree involved in the one or more first locks, the second lock, and the one or more third locks and within one of the levels of the namespace tree involved in the one or more first locks, the second lock, and the one or more third locks.

Claim 15. (currently amended) A method for performing first and second operations

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within a file system, comprising:

acquiring one or more first locks on one or more first directory names involved in the first operation;

acquiring one or more second locks on one or more second directory names involved in the second operation;

acquiring a third lock on a first pathname involved in the first operation;

acquiring a fourth lock on a second pathname involved in the second operation;

determining whether the first and third locks conflict with the second and fourth locks;

concurrently performing the first and second operations when the first and third locks do not conflict with the second and fourth locks, the one or more first locks, the one or more second locks, the third lock, and the fourth lock being read-write locks; and

serializing performance of the first and second operations when the first lock or the third lock conflicts with the second lock or the fourth lock, where serializing performance of the first and second operations includes:

determining an order for the first, second, third, and fourth locks based on levels of a namespace tree involved in the first, second, third, and fourth locks and within one of the levels of the namespace tree involved in the first, second, third, and fourth locks.

Claim 16. (currently amended) A method for performing first and second operations within a same directory, comprising:

obtaining a first lock on a sub-directory or file name within the directory by the first operation;

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obtaining a second lock on a sub-directory or file name within the directory by the second operation;

determining whether the first and second locks conflict;

concurrently performing the first and second operations when the first and second locks do not conflict, the first and second locks being read-write locks; and

serializing performance of the first and second operations when the first and second locks conflict, where serializing performance of the first and second operations includes:

determining an order for the first and second locks based on levels of a namespace tree involved in the first and second locks and within one of the levels of the namespace tree involved in the first and second locks.

Claim 17. (currently amended) A file system, comprising:  
a memory configured to store information regarding a plurality of directories and files as nodes in a namespace tree; and

a processor connected to the memory and configured to:

associate a read-write lock with each of the nodes in the namespace tree,

identify a set of the nodes involved in an operation, the identified nodes forming a pathname associated with the operation,

acquire a first one or more read-write locks, as one or more first locks, on the identified nodes,

acquire a second one of the read-write locks, as a second lock, on the pathname,

determine whether the one or more first locks or the second lock conflict with a



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read-write lock acquired by another operation,

permit the operation to execute when the one or more first locks and the second lock do not conflict with the read-write lock, and

serially execute the operation and the other operation when at least one of the one or more first locks or the second lock conflicts with the read-write lock acquired by the other operation, when serially executing the operation and the other operation, the processor is configured to:

determine an order for the one or more first locks, the second lock, and the read-write lock based on levels of the namespace tree involved in the one or more first locks, the second lock, and the read-write lock and within one of the levels of the namespace tree involved in the one or more first locks, the second lock, and the read-write lock.

***Allowable Subject Matter***

4. Claims 1-9 and 12-17 are allowed over the prior art of record.
5. The following is an examiner's statement of reasons for allowance:

Regarding independent claims 1, 13, 14, 15, 16 and 17, the prior art fails to disclose or suggest the claimed provision "serializing performance of the first and second operations when the first lock or the second lock conflicts with the third locks, where serializing performance includes determining an order for the first, second, and third locks based on levels of the namespace tree involved in the first, second, and third locks and within one of the levels of the namespace tree involved in the first, second, and third locks" as claimed in conjunction with remaining claims provisions.

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6. The dependent claims, being further limiting to the independent claims, definite and enabled by the Specification are also allowed.
7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

#### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure.

1. Adya et al. (US 7,062,490 B20 disclose serverless distributed file system.
2. Rao et al. (US 5,689,706) disclose distributed systems with replicated files.

#### ***Point of Contact***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hanh B. Thai whose telephone number is 571-272-4029. The examiner can normally be reached on 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Don Wong can be reached on 571-272-1834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Hanh B Thai  
Examiner  
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January 4, 2007

A handwritten signature in black ink, appearing to read 'Alford Kindred', written in a cursive style.

**ALFORD KINDRED  
PRIMARY EXAMINER**